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Anseth

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(54) **JOIST SUBFRAMING SYSTEMS AND METHODS**

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(51) **Int. Cl.**

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E04B 5/10	(2006.01)
E04B 1/41	(2006.01)
E04C 3/00	(2006.01)
E04C 3/07	(2006.01)
E04C 3/04	(2006.01)

(52) **U.S. Cl.**

CPC . ***E04B 5/10*** (2013.01); ***E04B 1/40*** (2013.01); ***E04C 3/005*** (2013.01); ***E04C 3/07*** (2013.01); *E04C 2003/0473* (2013.01)

(58) **Field of Classification Search**

CPC E04B 5/10; E04B 1/40; E04B 2003/0473; E04C 3/005; E04C 3/07

USPC 52/645, 646, 126.1, 126.5, 126.6

See application file for complete search history.

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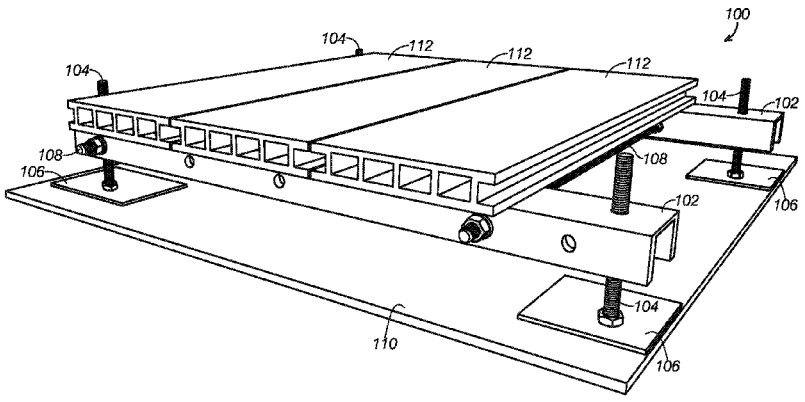
(57) **ABSTRACT**

Joist subframe systems including vertically arranged support members each having adjustable height securing members coupled with the support member in a fixed position and horizontally arranged elongate frame members configured to support one or more overlying surface members and shown and described. Each of the elongate frame members including an elongate body with at least one horizontal wall and one or more support member attachment mechanisms configured to couple one of the support members to the elongate body. In some examples, the adjustable height securing members are selectively tightenable and loosenable to the support members for adjustable coupling to the support member and to releasably fix a position of the support member to one of the plurality of elongate frame members.

18 Claims, 12 Drawing Sheets



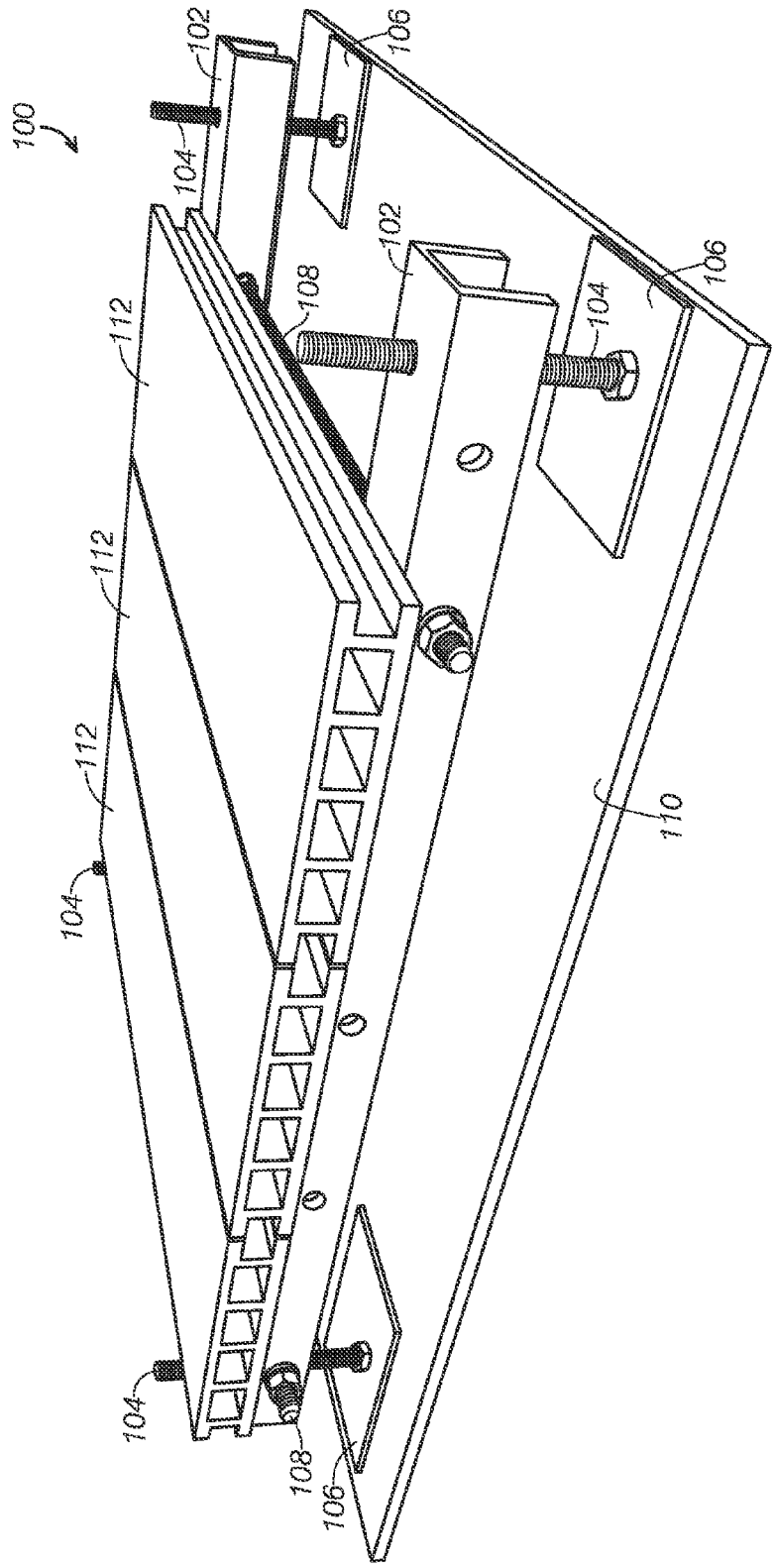


FIG.1

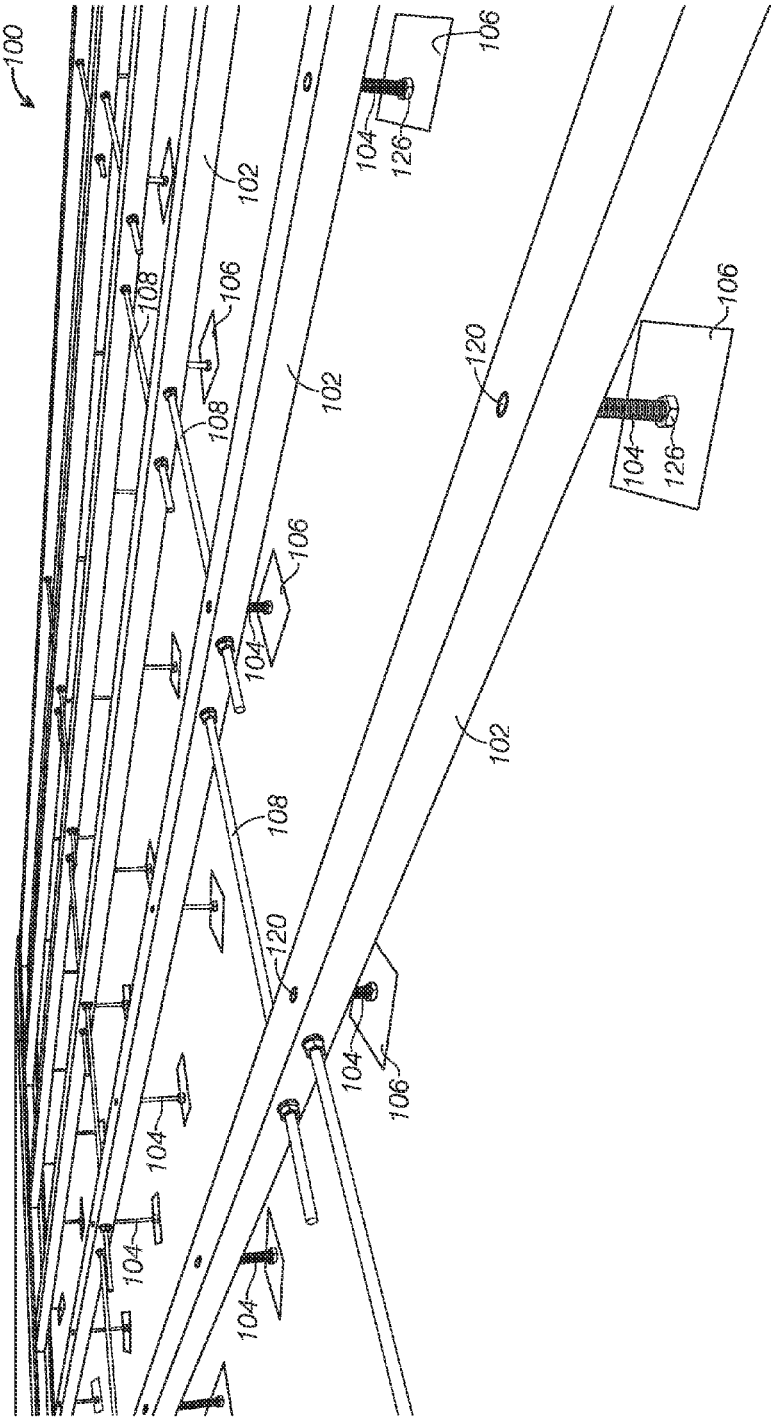
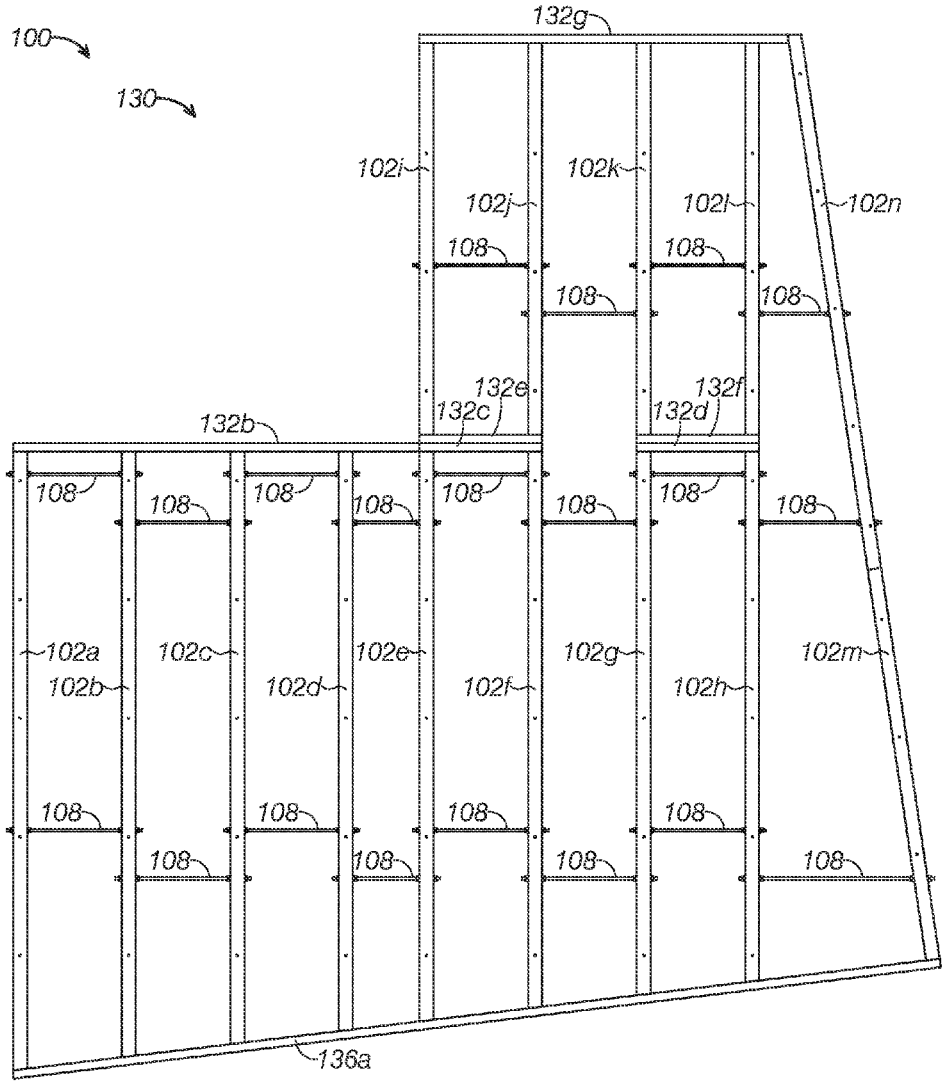


FIG.2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130
132g
102i
102k
102j
102l
102n
108
132e
132c
132f
132d
132b
102a
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102d
102e
102f
102g
102h
102m
136a

FIG.3

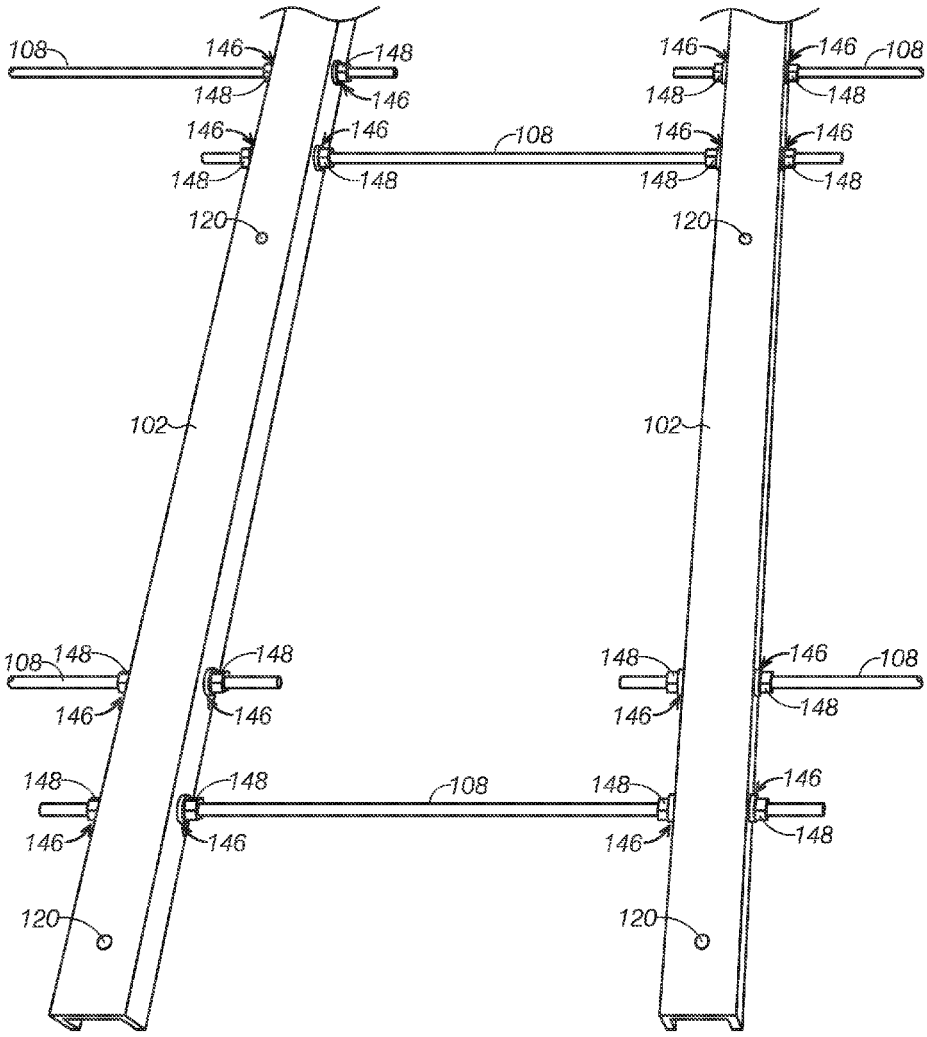

FIG.4

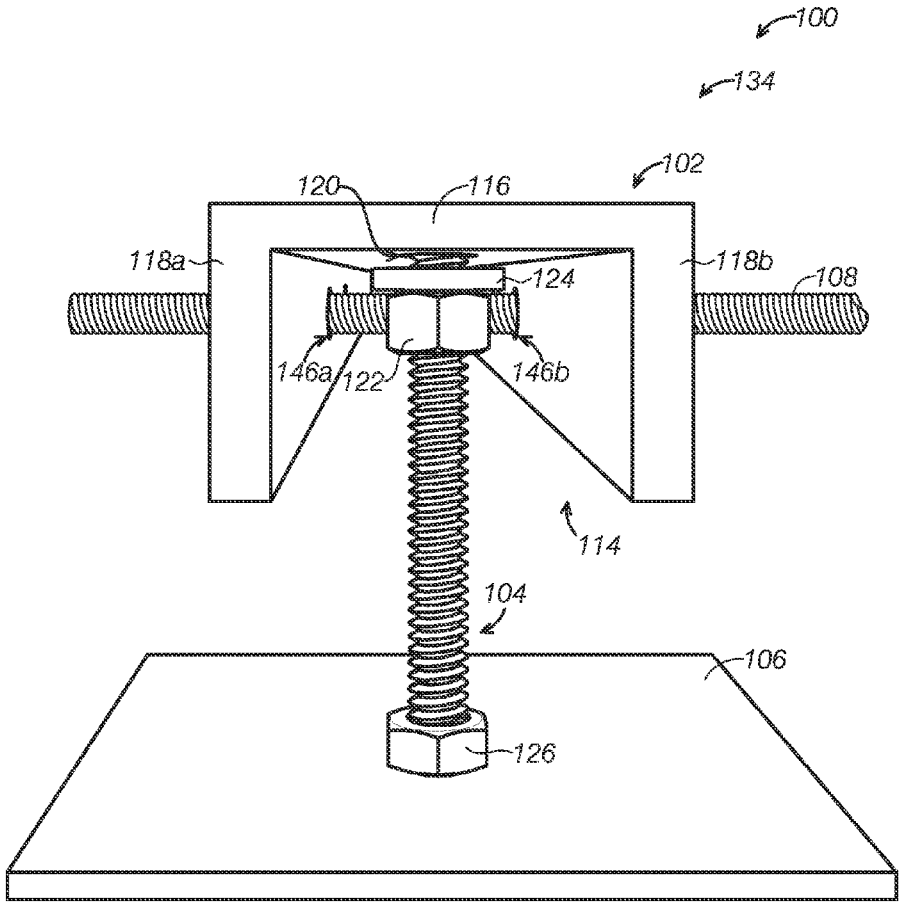
100
134
102
120
116
118a
118b
124
108
146a
122
146b
114
104
106
126

FIG.5

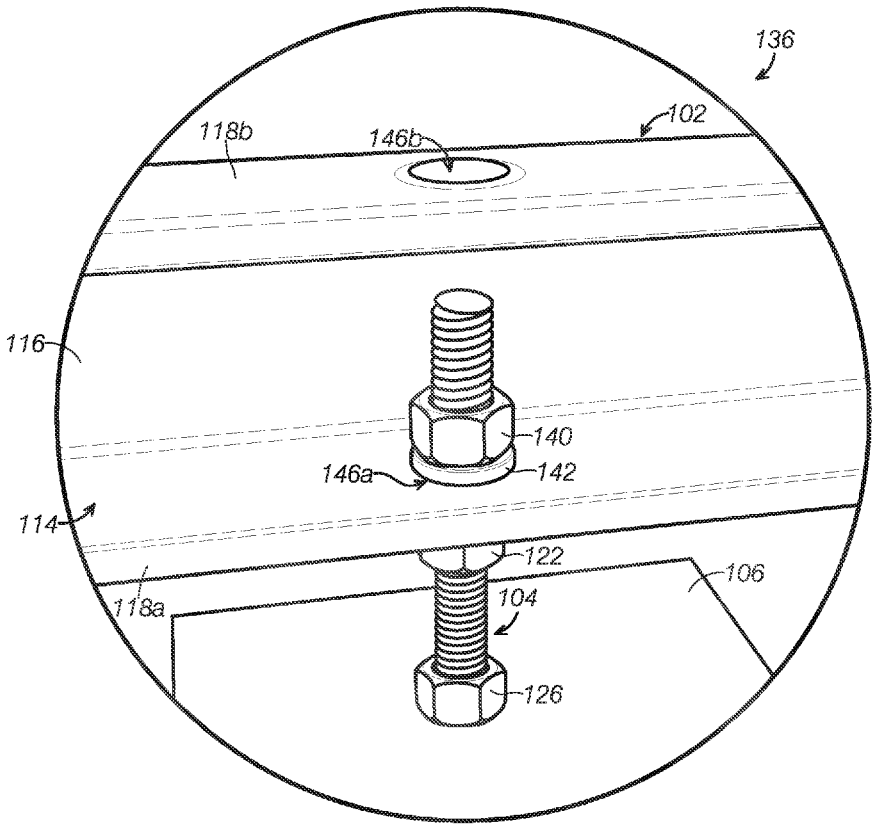

FIG.6

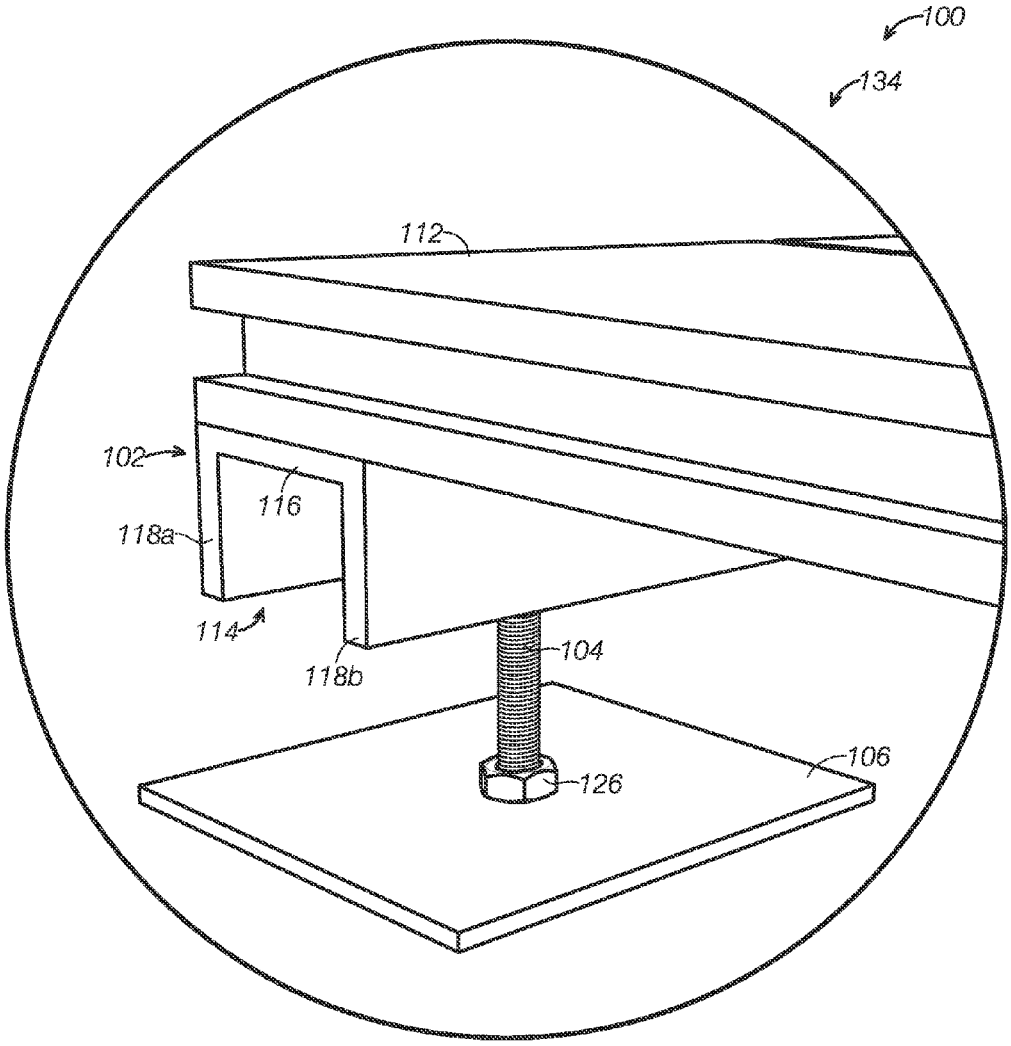

FIG.7

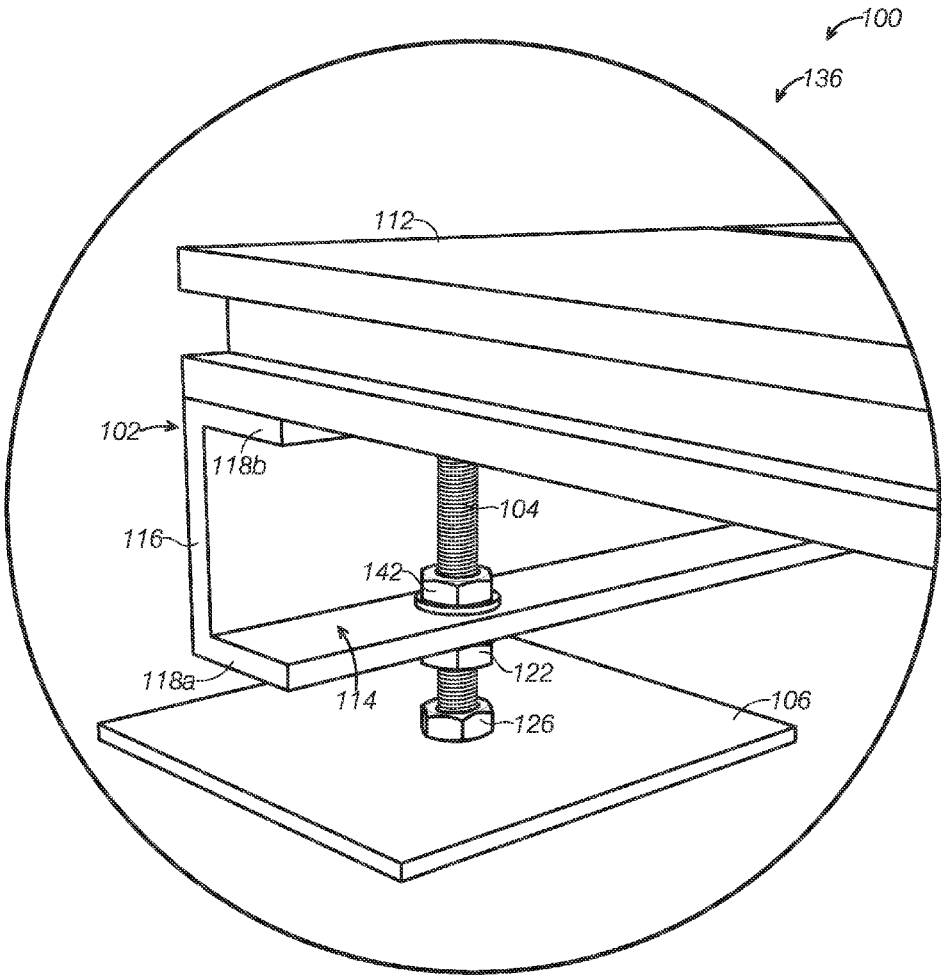

FIG.8

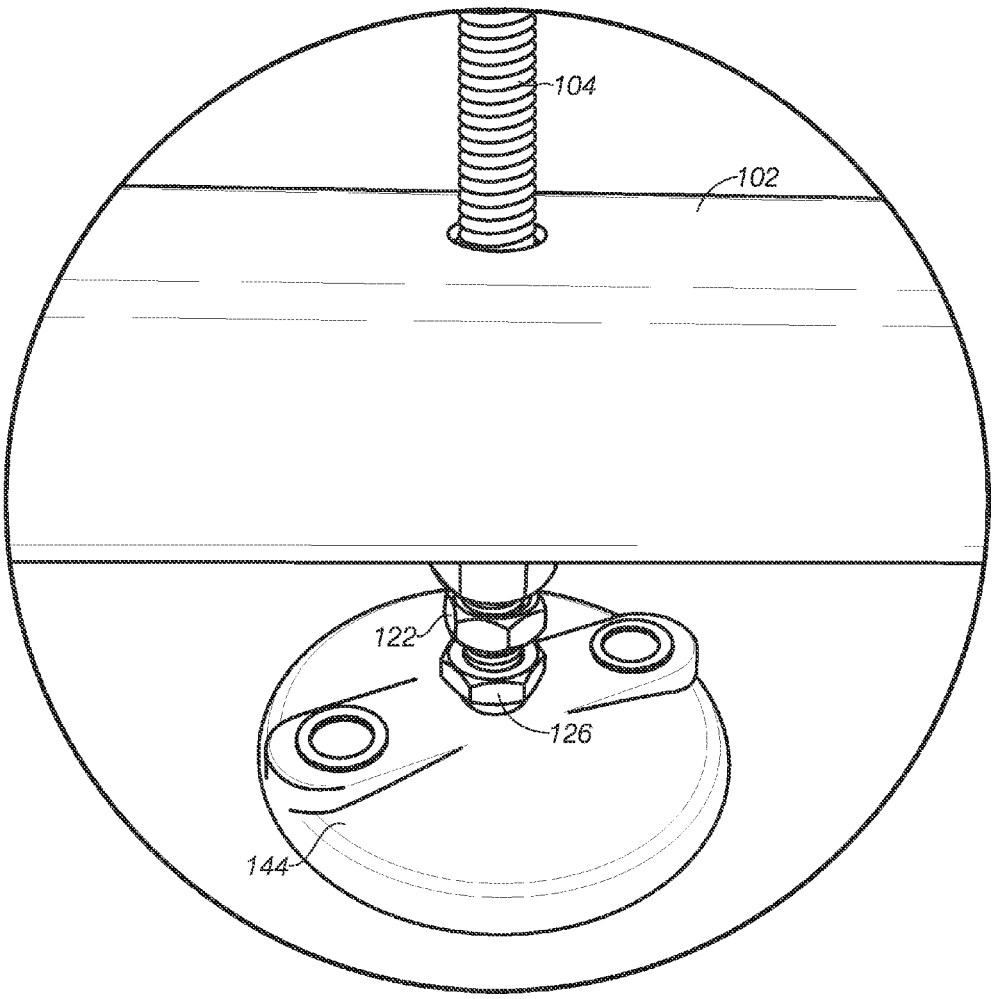

FIG.9

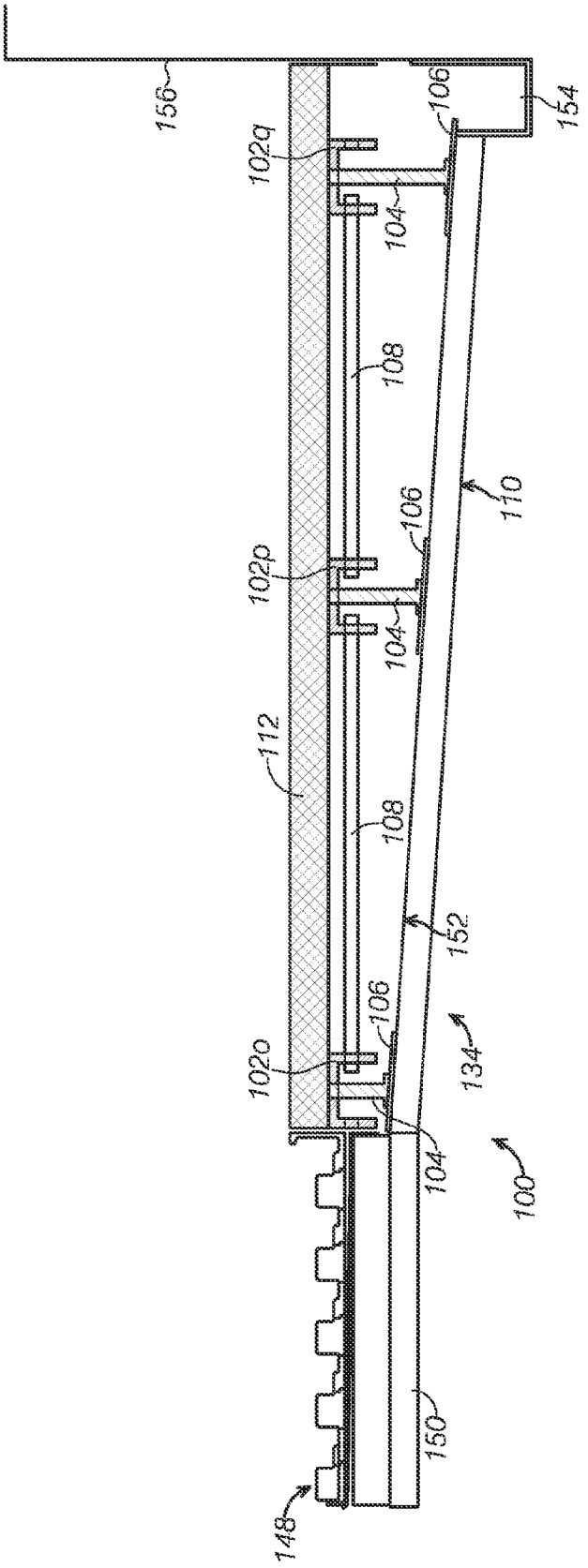
156
102q
106
154
104
108
110
106
102p
104
112
108
152
106
102o
134
104
100
150
148

FIG.10

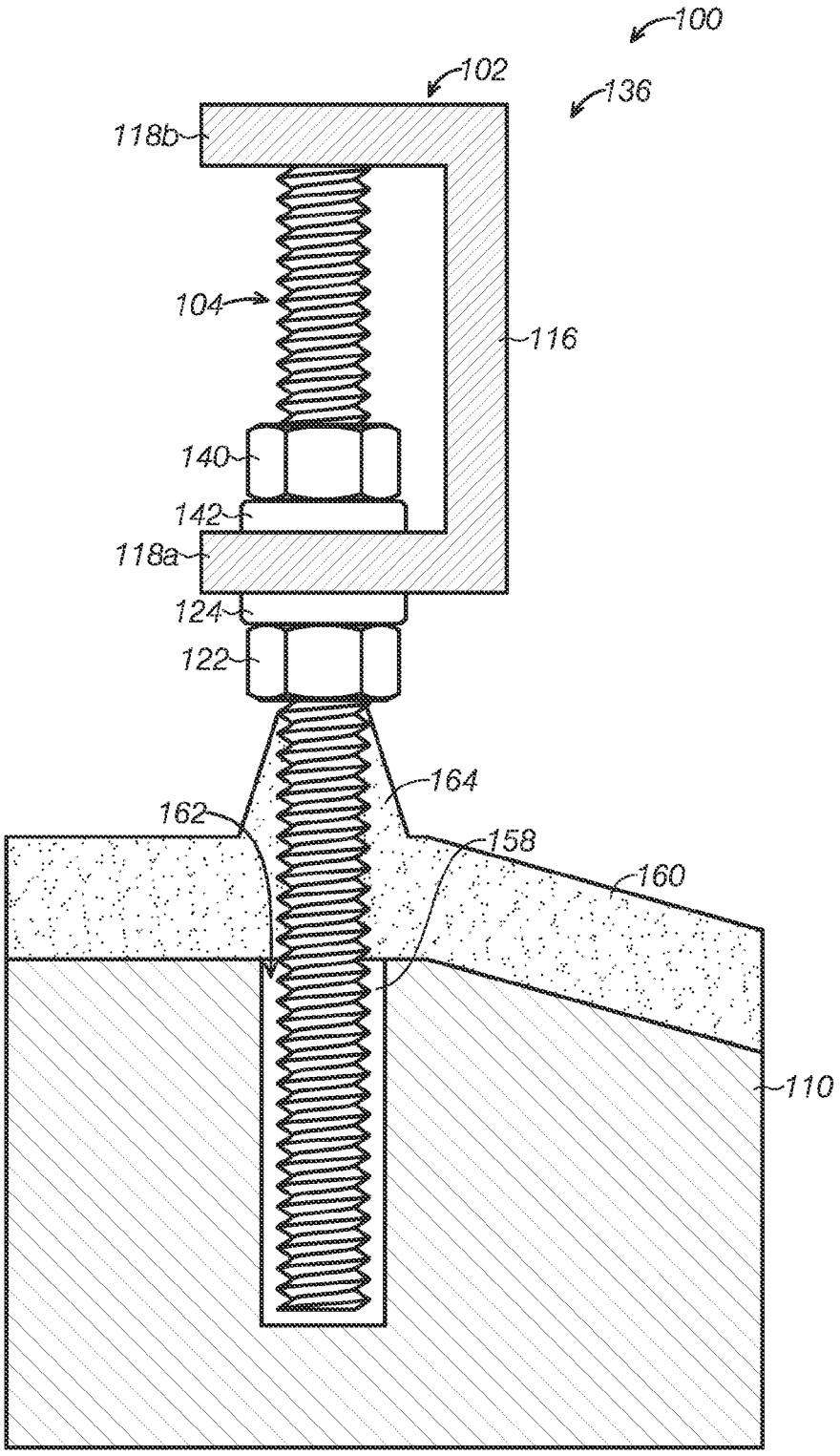
100
102
136
118b
104
116
140
142
118a
124
122
164
162
158
160
110

FIG.11

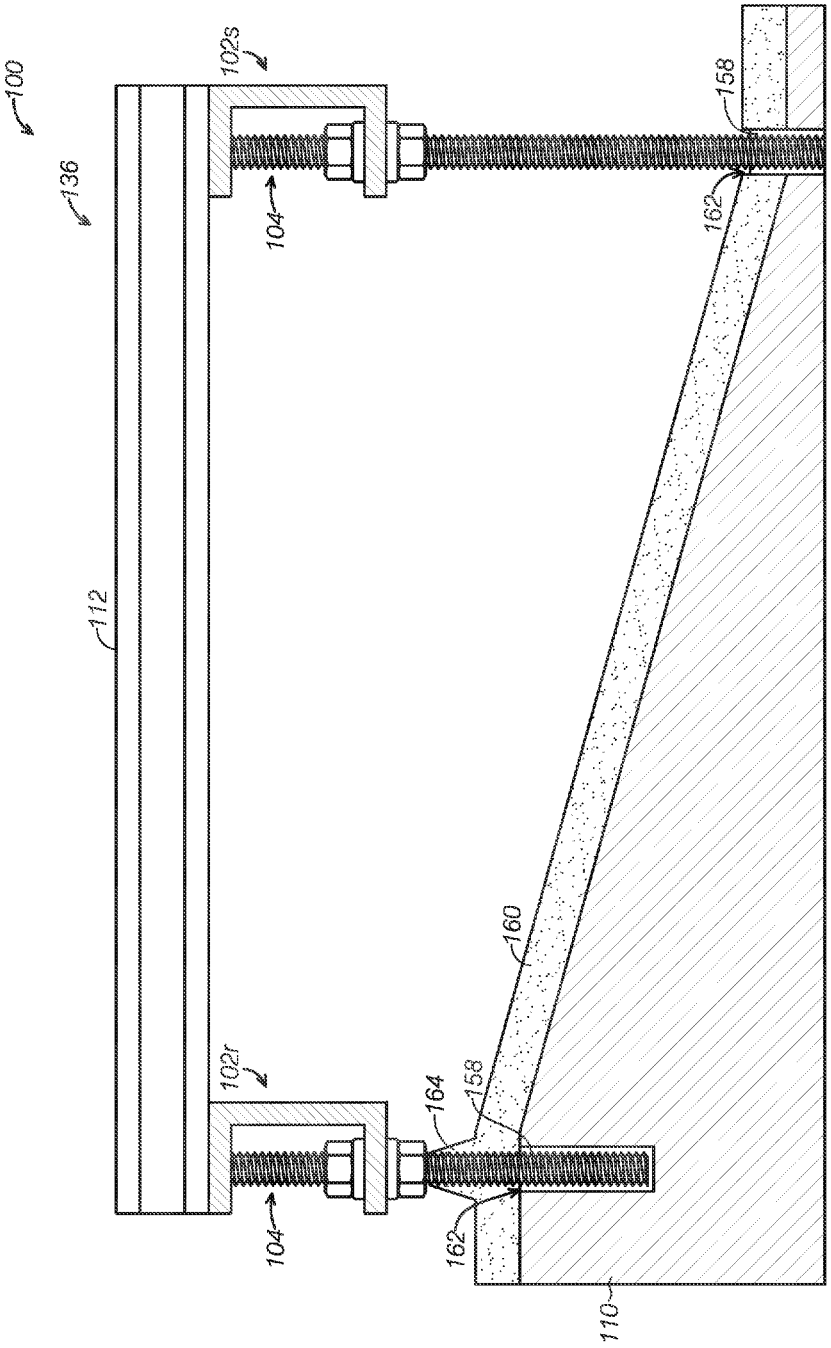

FIG.12

JOIST SUBFRAMING SYSTEMS AND METHODS

BACKGROUND

The present disclosure relates generally to joist subframing systems. In particular, joist subframing systems including horizontally arranged elongate frame members (i.e., joist members) each being adjustably attached to vertically arranged support members are shown and described.

Joist subframing systems include horizontal supporting members that run between foundations, walls, and/or beams to support an overlying structure (e.g., an exterior deck, an interior floor, etc.). Known joist subframing systems are not entirely satisfactory for the range of applications in which they are employed. For example, existing joist frames are comprised of wood joist beams that can have a high weight and profile of the joist frame, and are subject to decay, rot, and/or insect infestation. In an additional example, conventional joist subframes cannot be easily adjusted for a desired height of a surface and/or to create a level surface (e.g., floor) over an uneven and/or angled underlying surface. In even another example, some joist systems cannot be used in combination with underlying waterproofing systems and/or can tear/puncture an underlying waterproofing system. In this example, water may collect under the joist subframe and cause damage to a foundation and/or other adjacent structures.

Thus, there exists a need for joist subframing systems and methods that improve upon and advance the design of known joist subframing systems. Examples of new and useful joist subframing systems relevant to the needs existing in the field are discussed below.

Disclosure addressing one or more of the identified existing needs is provided in the detailed description below. Examples of references relevant to joist subframing systems include U.S. Patent References: U.S. Pat. No. 6,332,292 and U.S. Pat. No. 8,256,175. The complete disclosures of the above patents and patent applications are herein incorporated by reference for all purposes.

SUMMARY

The present disclosure is directed to a joist subframe system including vertically arranged support members each having adjustable height securing members coupled with the support member in a fixed position and horizontally arranged elongate frame members configured to support one or more overlying surface members. Each of the elongate frame members including an elongate body with at least one horizontal wall and one or more support member attachment mechanisms configured to couple one of the support members to the elongate body. In some examples, the adjustable height securing members are selectively tightenable and loosenable to the support members for adjustable coupling to the support member and to releasably fix a position of the support member to one of the plurality of elongate frame members.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a first example of a joist subframing system with overlying surface members.

FIG. **2** is a perspective view of the first example of a joist subframing system shown in FIG. **1** depicting the joist subframe without the overlying flooring beams.

FIG. **3** is a top plan view of the first example of a joist subframing system shown in FIG. **1**, showing one example configuration tor the joist subframe.

FIG. **4** is a top plan view of a portion of the first example of a joist subframing system shown in FIG. **1** depicting horizontally arranged securing members.

FIG. **5** is a longitudinal perspective view of the first example of a joist subframing system shown in FIG. **1** depicting a first example configuration for the elongate frame member and a first example foot member.

FIG. **6** is a perspective view of the first example of a joist subframing system shown in FIG. **1** depicting a second example configuration for the elongate frame member and the first example foot member.

FIG. **7** is a perspective view of the first example of a joist subframing system shown in FIG. **1** depicting the elongate frame member in the first example configuration with an associated overlying surface member.

FIG. **8** is a perspective view of the first example of a joist subframing system shown in FIG. **1** depicting the elongate frame member in the second example configuration with an associated overlying surface member.

FIG. **9** is a perspective view of the first example of a joist subframing system shown in FIG. **1** depicting the elongate frame member in the second example configuration with a second example foot member.

FIG. **10** is a side elevation view of the first example of a joist subframing system shown in FIG. **1** depicting associated overlying surface members and a first example underlying water proofing system.

FIG. **11** is a cross-sectional view of the first example of a joist subframing system shown in FIG. **1** depicting the elongate frame member in the second example configuration with a second example underlying waterproofing system.

FIG. **12** is a cross-sectional view of the first example of a joist subframing system shown in FIG. **1** depicting the elongate frame member in the second example configuration with a second example underlying waterproofing system.

DETAILED DESCRIPTION

The disclosed joist subframing systems and methods will become better understood through review of the following detailed description in conjunction with the figures. The detailed description and figures provide merely examples of the various inventions described herein. Those skilled in the art will understand that the disclosed examples may be varied, modified, and altered without departing from the scope of the inventions described herein. Many variations are contemplated for different applications and design considerations; however, for the sake of brevity, each and every contemplated variation is not individually described in the following detailed description.

Throughout the following detailed description, examples of various joist subframing systems and methods are provided. Related features in the examples may be identical, similar, or dissimilar in different examples. For the sake of brevity, related features will not be redundantly explained in each example. Instead, the use of related feature names will cue the reader that the feature with a related feature name may be similar to the related feature in an example explained previously. Features specific to a given example will be described in that particular example. The reader should understand that a given feature need not be the same or similar to the specific portrayal of a related feature in any given figure or example.

With reference to FIGS. **1-12**, a first example of a joist subframing system, joist system **100** will now be described. Joist system **100** includes elongate frame members **102**, support members **104**, foot members **106**, and fastening members **108**. Joist system **100** is disposed between an underlying surface **110** (e.g., a ground surface, a foundation surface, etc.) and an overlying surface members **112**. Elongate frame members **102** are metallic frame members (e.g., aluminum elongate frame members) that include attachment mechanisms for support members and the height of the elongate member on the support member can be selectively adjusted. Accordingly, joist system **100** functions to support an overlying floor surface. Additionally or alternatively, joist system **100** can be used to support a ceiling and/or roof surface.

Joist system **100** addresses many of the issues and problems that occur with conventional joist subframes. For example, the elongate frame members are comprised of a metallic material that is not subject to insects, rot, and decay. In another example, as attachment mechanisms are built into the elongate frame members, joist subframe system **100** has an overall lower profile and heights of the elongate frame members are easily adjusted and/or leveled to create a level overlying surface. In even another example, joist subframe system **100** can be used in combination with multiple types of underlying water proofing layers.

As can be seen in FIGS. **1-3**, each, of elongate frame members **102** are horizontally arranged. Further, most of elongate frame members **102** are generally parallel and equally spaced relative to adjacent elongate frame members. It will be appreciated that joist subframe system **100** can be used to create a desired configuration for a floor. FIG. **3** shows one example arrangement/configuration **130** for a joist subframe.

In the example of FIG. **3**, elongate frame members **102***a*-**102***h* are parallel to each other and elongate frame members **102***i*-**102***l* are parallel to each other, while elongate member **102***m* is disposed at an angle relative to elongate frame members **102***a*-**102***h* and elongate member **102***n* is disposed at an angle relative to elongate frame members **102***i*-**102***l*. Further, some elongate frame members (e.g., **102***e* and **102***i*, **102***f* and **102***j*, **102***g* and **102***k*, **102***h* and **102***l*, **102***m* and **102***n*) are in a linear configuration, and are substantially continuous in arrangement/configuration **130**. Parallel elongate frame members (**102***a*-**102***h* and **102***i*-**102***l*) and elongate frame members disposed at an angle relative to parallel elongate frame members (**102***m* and **102***n*) are joined by horizontally arranged fastening members **108**.

As depicted in FIG. **4**, fastening members **108** are inserted through holes **146** in each of elongate frame members **102**. A first end of each fastening member **108** is attached to one elongate frame member **102** and a second end of the fastening member **108** is attached to an adjacent elongate frame member **102**. A position of each of fastening members **108** is releasably fixed by coupling and/or attachment of a securing member **148** to the fastening member on each of a first side and a second side of an associated elongate frame member **108**. Fastening members **108** are attached to vertical walls of the elongate frame members.

In the present example, fastening members **108** are threaded members and securing members **148** are nuts that are complimentarily configured to the threaded members. Further, a washer can be disposed between securing member **148** and a wall of the elongate frame member. In one specific example, the fastening members, the nuts, and the washers are ⅜" stainless steel. In alternate examples, one or more of the fastening members and the securing members can have a different configuration. In one specific alternate example, the fastening members can be non-threaded members and the securing members can be releasable clamping members.

Returning to FIG. **3**, in some examples only one fastening member **108** is used to join adjacent elongate frame members (e.g., elongate frame members **102***i*-**102***l*). In other examples, two fastening members **108** are used to join adjacent fastening members (e.g., elongate frame members **102***a*-**102***h*). It will be appreciated that more or fewer fastening members can be used to attach adjacent elongate frame members. It will be further appreciated that fastening member can be of equal length to accommodate elongate frame members that are parallel relative to adjacent elongate frame members (e.g., fastening members **108** attached between elongate frame members **102***a*-**102***d*) and/or fastening members can be of different lengths to accommodate elongate frame members disposed at an angle relative to adjacent elongate frame members (e.g., fastening members attached between elongate frame members **102***h* and **102***m*).

As depicted in FIG. **3**, joist system **100** further includes capping members **132** (e.g., **132***a*-**132***f*). Capping members can be square tubes comprised of a metallic material, such as aluminum or steel. Capping members can be any desired length that is necessary to "cap" an ends of elongate frame members **102** and are generally perpendicular relative to the elongate frame members. In one specific example, capping members are 25'×1¼"×1¼" aluminum square members that can be cut to a desired length using a blade, such as a carbide blade.

In the present example configuration, capping member **132***a* is a longer capping member that caps a first end of elongate frame members **102***a*-**102***h* and **102***m*, capping member **132***b* is a shorter capping member that caps a second opposing end of elongate frame members **102***a*-**102***d* and capping members **132***c* and **132***d* are even shorter capping members that cap a second opposing end of elongate frame members **102***e* and **102***f*, and **102***g* and **102***h*, respectively.

Capping members **132***e* and **132***f* are of a substantially equal length relative to capping members **132***c* and **132***d*. Capping member **132***e* caps a first end of elongate frame members **102***i* and **102***j*, while capping member **132***f* caps a first end of elongate members **102***k* and **102***l*. A second opposing end of elongate frame members **102***i*-**102***l* and **102***n* are capped by a capping member **132***g*, which is of a substantially equal length relative to capping member **132***b*. Longitudinal faces of capping members **132***c* and **132***e*, and **132***d* and **132***f* can be attached via attachment members and/or an adhesive (not specifically shown).

In alternate examples, a single capping member can be used to cap a second end of an elongate frame member and a first end of a linearly aligned other elongate frame member. In other words, capping member **132***c* could be a capping member for second ends of elongate frame members **102***e* and **102***f* and first ends of elongate frame members **102***i* and **102***j*. In even other alternate examples, capping members can be excluded from joist system **100**.

Turning attention to FIGS. **5** and **6**, in the present example, die elongate frame members are each "C" channel elongate frame members comprised of a metallic material. In one specific example, the "C" channel elongate frame members are 25'×1¼"×2" aluminum joists. The elongate frame members can be cut to a desired length using a blade, such as a carbide blade.

As shown in FIG. **5**, in a first example orientation **134**, the "C" channel elongate frame members are oriented so that an open side **114** is faced downward (i.e., faced toward an

underlying ground surface). Accordingly, in the configuration shown in FIG. **5**, each elongate frame member **102** includes a central wall **116** with two side walls **118** (i.e., **118***a* and **118***b*) extended downwardly from opposing ends of central wall **116**. In this example, central wall **116** is a horizontal central top wall and side walls **118** are vertical side walls. As described above in reference to FIG. **4**, fastening member **108** is inserted through holes **146** (i.e., holes **146***a* and **146***b*) in the side walls **118** (i.e., side walls **118***a* and **118***b*, respectively) of elongate frame member **102**.

Central wall **116** includes receiving holes **120** for coupling elongate frame members **102** to support members **104**. As shown in FIG. **5**, support members **104** are threaded members configured to be inserted through holes **120**. Therefore, the through holes are a support member attachment mechanism configured to couple one of the support members to the elongate body of the elongate frame members. Each of adjustable height securing members **122** are positionally adjustable and coupled to one of support members **104** in order to releasably fix a position of the support member and the elongate frame member. In other words, the adjustable height securing members are selectively tightenable and loosenable to one of the support members to releasably fix a height of coupling of the elongate frame member to the support member.

In the present example, securing members **122** are nuts that are complimentarily configured to the threaded members and one of washers **124** (e.g., a lock washer) are disposed between securing member **122** and central wall **116**. In one specific example, the support member, the securing members, and the washers are ⅜" stainless steel. In alternate examples, one or more of the support members and the adjustable height securing members can have a different configuration. In one specific alternate example, the support members can be non-threaded members and the adjustable height securing members can be releasable clamping members.

Looking now at FIG. **6**, a second example orientation **136** for the "C" channel elongate frame members will now be described. Second example orientation **136** includes many similar or identical features to configuration **134**. Thus, for the sake of brevity, each feature of orientation **136** will not be redundantly explained. Rather, key distinctions between orientations **136** and **134** will be described in detail and the reader should reference the discussion above for features substantially similar between the two orientations.

As shown in FIG. **6**, in second example orientation **136**, "C" channel elongate frame members are oriented so that open side **114** is faced to a side (i.e., faced toward perpendicular to an underlying ground surface). Accordingly, in the configuration shown in FIG. **6**, each elongate frame member **102** includes a central wall **116** with two horizontal side walls **118** extended to parallel to an underlying ground surface away from opposing ends of central wall **116**. In this example, central wall **116** is a vertical central side wall, side wall **118***a* is a bottom horizontal wall, and side wall **118***b* is a top horizontal waill.

Central wall **116** includes receiving holes **138***a* for coupling elongate frame members **102** to support members **104**. As shown in FIG. **6**, support members **104** are threaded members configured to be inserted through holes **138***a*. Therefore, the through holes are a support member attachment mechanism configured to couple one of the support members to the elongate body of the elongate frame members. Each of adjustable height securing members **122** are positionally adjustable and coupled to one of support members **104** to releasably fix a position of the support member and the elongate frame member. Further, adjustable height securing member **122** is a bottom side securing member (i.e., securing member **122** is secured on bottom of central wall **116**).

In the present example, adjustable height securing members **122** are nuts that are complimentarily configured to the threaded members and one of washers **124** are disposed between securing member **122** and side wall **118***a*. In one specific example, the support member, the securing members, and the washers are ⅜" stainless steel. In alternate examples, one or more of the support members and the adjustable height securing members can have a different configuration. In one specific alternate example, the support members can be non-threaded members and the adjustable height securing members can be releasable clamping members.

Differently from first example configuration **134**, example configuration **136** includes a second securing member **140**, which is a top side securing member (i.e., securing member **140** is secured on a top side of wall **118***a*). Similar to securing member **122**, each of securing members **140** are positionally adjustable and coupled to one of support members **104** to assist in releasably fixing a position of the support member and the elongate frame member.

In the present example, securing members **140** are nuts that are complimentarily configured to the threaded members and one of washers **142** are disposed between securing member **140** and side wall **118***a*. In alternate examples, one or more of the support members and the securing members can have a different configuration. In one specific example, the support members can be non-threaded members and the securing members can be releasable clamping members. In even other alternate examples, the joist system can exclude the top side securing member. Although not specifically shown, it will be appreciated that fastening members **108** can be inserted through and attached to the elongate frame members via holes **120**.

FIGS. **7** and **8** show elongate members **102** in configurations **134** and **136**, respectively, supporting overlying surface members **112**. As depicted in FIG. **7**, in configuration **134**, central wall **116** is abutted to and supports overlying surface member **112**. Alternatively, as depicted in FIG. **8**, in configuration **136**, side wall **118***b* is abutted to and supports overlying surface member **112**. It will be appreciated that in the second example configuration (where the central wall is a vertical wall) either of side wall **118***a* or **118***b* can be a top wall and be abutted to and support the overlying surface member.

In one example, when joist frames at adjoining horizontal surfaces require substrates less than 1¼", the first example orientation (i.e., first example orientation **134** shown in FIGS. **1-5**, **7**, and **10**) for the elongate frame members can be advantageous due to the low profile design thereby accommodating surrounding height restrictions. Alternatively, in another example where the joist subframe is applied over a primary substrate (e.g., poured concrete slab on grade) and penetrations to the substrate are possible, the second example orientation (i.e., second example orientation **136** shown in FIGS. **6**, **8**, **9**, **11**, and **12**) position of the elongate frame members coupled with embedded supports provides an increased rigid platform, reducing flex between the adjustable supports due to its configuration. Accordingly, in this example, the second example orientation **136** may be advantageous.

As shown in FIGS. **5-8**, an opposing end of each of support: members (i.e., a bottom end of each of the support members) includes a bolt head **126**. Bolt head **126** is abutted

to foot member **106**. In the present example, foot member **106** is a rectangular sheet comprised of a metallic material, such as steel, aluminum, etc. In other examples, the foot member can be comprised of a non-metallic material, such as rubber, cork, etc. Foot member **106** distributes the pressure and/or weight of the support member and the elongate frame member over a wider surface area than the surface area of the bolt head **126**. Accordingly, the foot member can be used to prevent penetration of the support member into one or more of an underlying water proofing layer and an underlying surface. In other words, foot member is configured to cushion the bottom end of the support member against the underlying surface. The foot members are "distribution pads".

Additionally or alternatively, bolt head **126** can be abutted to or coupled with a leveling mount, such as leveling mount **144** shown in FIG. **9**. Leveling mount **144** can be comprised of rubber or a metallic material. A variety of leveling mounts can be used in combination with joist system **100**, such as those described in U.S. Pat. No. 6,910,666 and U.S. Pat. No. 6,742,750. Further, suitable leveling mounts can include those from available from McMaster-Carr® (e.g., leveling mounts, ultra-high capacity leveling mounts, swivel leveling mounts, stainless steel swivel leveling mounts, bolt down swivel leveling mounts, low -profile swivel leveling mounts, high-capacity acme threaded swivel leveling mounts, etc.). In alternate examples, the support member can exclude the bolt head and can be used in combination with leveling mounts having threaded holes. For example, suitable leveling mounts having threaded holes can include those from McMaster-Carr® (e.g., swivel leveling mounts with threaded holes, bolt-down swivel leveling mounts with threaded holes, etc.).

Turning now to FIG. **10**, joist system **100** is shown in combination with a door threshold **148**, deck sheeting **150**, a waterproof membrane **152**, a perimeter drain **154**, and a stem wall **156**. In the example of FIG. **10**, elongate frame members **102** are in configuration/orientation **134** (shown in FIG. **5** and described above). Accordingly, the central wall of each elongate frame member supports overlying surface members **112**. It will be appreciated that in alternate examples the elongate members can instead be in configuration/orientation **136** (shown in FIG. **6** and described above). Further, in this example, overlying surface members **112** comprise a deck surface.

Overlying surface members **112** have a level configuration over an inclined ground surface **110**. In order to create the level overlying surface, an elongate frame member **102***o* is fixed/secured at a shorter height over a higher point in the surface, an elongate frame member **102***p* is fixed/secured at a median height at a median point in the surface, and an elongate frame member **102***q* is fixed/secured at a higher height at a lower point in the surface. It will be appreciated that more or fewer elongate members fixed at level heights corresponding to their location on the inclined surface can be used to support the overlying surface members.

As shown in FIG. **10**, joist system **100** and overlying surface members **112** (e.g., Resysta®, Trex®, Timber Tech®, Fiberon®, Tile and Stone, etc.), are aligned with the horizontal plane of door threshold **148** (e.g., Fleetwood, Pella®, Andersen®, Milgard®, etc.). Used as primary deck framing, joist system **100** allows for easy and secure adjustments to create a level finished surface over a multiple angle substrate and/or waterproofing membrane (e.g., Desotex®, Semco®, Tremco®, Shluter®, etc.). This configuration allows a level surface by use of the joist framing system adjusted over an uneven and/or unlevel ground surface without penetrating in the waterproofing membrane below. Moisture can pass through gaps in decking surface, collect, and/or drain into one or more drains made of PVC, stainless steal, copper, etc. (e.g., drain **154**).

FIGS. **11** and **12** show an alternate association of joist system **100** with underlying surface. In this example, support members **104** are inserted into holes **158** in ground surface **110**. In other words, the ground surface includes a plurality of receiving holes that are configured to receive a bottom end of one of the support members. Further, in this example, support member **104** excludes a bolt head. A water proofing layer **160** is disposed over the ground surface. Further, water proofing layer **160** covers an opening **162** of hole **158** and encompasses a lower portion of support member **104** (i.e., a portion of support member **104** that is below securing member **122**) via a water proof boot **164**. The water proof boot forms a water-tight seal around a circumference of the lower end of the support member.

In the depicted example shown in FIGS. **11** and **12**, elongate frame members **102** are in configuration/orientation **136** (shown in FIG. **6** and described above). Accordingly, one of the side walls supports overlying surface members **112**. It will be appreciated that in alternate examples the elongate members can instead be in configuration/orientation **136** (shown in FIG. **6** and described above). Further, in this example, overlying surface members **112** comprise a deck surface.

Similarly to the example shown in FIG. **10**, the example shown in FIG. **12** shows overlying surface members **112** having a level configuration over an inclined ground surface **110**. In order to create the level overtone surface, an elongate frame member **102***r* is fixed/secured at a shorter height over a higher point in the surface and an elongate frame member **102***r* is fixed/secured at a higher height at a lower point in the surface. It will be appreciated that more elongate members fixed at level heights corresponding to their location on the inclined surface can be used to support the overlying surface members.

In one specific example for FIG. **12**, the joist system is attached to vertical ⅜ SS all threads by use of ⅜ nuts and lock washers anchored with epoxy/adhesive (e.g., Simpson Strong-Tie®, PL Premium®, etc.) into substrates such as concrete by drilling 2" deep holes. Once the joist system is attached and adjusted to a level height, the overlying surface members (e.g., Resysta®, Trex®, Timber Tech®, Fiberon®, Tile and Stone, etc.) can be attached. Concrete slabs with a waterproofing membrane (e.g., Dexotex®, Semco®, Tremco®, Shluter®, etc.) applied on a top of the ground surface can be re-waterproofed using waterproofing boots (e.g., vinyl, other water proofing material, etc.). Alternatively, the waterproofing layer can exclude the use of waterproofing boots left when used over surfaces like slab on grade. In this example, water can pass through the gaps in finish surface and be directed to area drains below.

The disclosure above encompasses multiple distinct inventions with independent utility. While each of these inventions has been disclosed in a particular form, the specific embodiments disclosed and illustrated above are not to be considered in a limiting sense as numerous variations are possible. The subject matter of the inventions includes all novel and non-obvious combinations and subcombinations of the various elements, features, functions and/or properties disclosed above and inherent to those skilled in the art pertaining to such inventions. Where the disclosure or subsequently filed claims recite "a" element, "a first" element, or any such equivalent term, the disclosure or claims

should be understood to incorporate one or more such elements, neither requiring nor excluding two or more such elements.

Applicant(s) reserves the right to submit claims directed to combinations and subcombinations of the disclosed inventions that are believed to be novel and non-obvious. Inventions embodied in other combinations and subcombinations of features, functions, elements and/or properties may be claimed through amendment of those claims or presentation of new claims in the present application or in a related application. Such amended or new claims, whether they are directed to the same invention or a different invention and whether they are different, broader, narrower or equal in scope to the original claims, are to be considered within the subject matter of the inventions described herein.

The invention claimed is:

1. A joist subframe system, comprising:

a plurality of vertically arranged support members having a plurality of adjustable height securing members, each of the plurality of adjustable height securing members coupled with one of the plurality of support members to be in a fixed position on the support member; and

a plurality of horizontally arranged elongate frame members configured to support one or more overlying surface members, each of the plurality of elongate frame members are further arranged in a generally parallel configuration relative to others of the plurality of elongate frame members, each of the plurality of elongate frame members having:

an elongate body with at least one horizontal wall, and one or more support member attachment mechanisms each configured to couple one of the plurality of support members to the elongate body, wherein the one or more support member attachment mechanisms comprise one or more through holes in the at least one horizontal wall of the elongate body, one of the plurality of support members being inserted through each of the one or more through holes.

2. The joist subframe system of claim **1**, wherein each of the plurality of adjustable height securing members are selectively tightenable and loosenable to one of the plurality of support members for adjustable coupling to the support member and to releasably fix a position of the support member to one of the plurality of elongate frame members.

3. The joist subframe system of claim **1**, further comprising a plurality of foot members, each of the plurality of foot members abutted to a bottom end of one of the plurality of the support members and configured to cushion the bottom end of the support member against an underlying surface.

4. The joist subframe system of claim **1**, further comprising an underlying surface, the underlying surface comprising a plurality of receiving holes therein, each of the plurality of receiving holes configured to receive a bottom end of one of the plurality of support members.

5. The joist subframe system of claim **4**, further comprising a water proofing layer over the underlying surface and a plurality of water proofing boots, each of the plurality of water proofing boots forming a water tight seal around a circumference of one of the plurality of support members.

6. The joist subframe system of claim **1**, wherein the elongate body further comprises at least one vertical wall, and

wherein the joist subframe system further comprises a plurality of horizontally arranged elongate fastening members, each of the plurality of fastening members having a first end and a second end, the first end being attached to the at least one vertical wall of a first elongate frame member and the second end being attached to the at least one vertical wall of a second elongate frame member, the first elongate frame member being adjacent to the second elongate frame member.

7. The joist subframe system of claim **1**, wherein the elongate body comprises a "C" channel joist.

8. The joist subframe system of claim **7**, wherein the "C" channel joist is oriented such that the at least one horizontal wall is a central top wall with two vertical side walls, each of the plurality of support members being attached to the central top wall.

9. The joist subframe system of claim **7**, wherein the elongate body further comprises at least one vertical wall, and

wherein the "C" channel joist is oriented such that the at least one vertical wall is a central vertical wall with a horizontal top wall and a horizontal bottom wall, each of the plurality of support members being attached to at least the horizontal bottom wall.

10. The joist subframe system of claim **1**, wherein each of the plurality of support members is a threaded member and each of the securing members is complimentarily configured to the threaded member.

11. The joist subframe system of claim **1**, wherein the plurality of adjustable height securing members comprises a plurality of top securing members and a plurality of bottom securing members, each of the plurality top securing members being attached to one of the plurality of support members on a top side of the at least one horizontal wall and being abutted to a top side of the at least one horizontal wall, each of the plurality of bottom securing members being attached to one of the plurality of support members on a bottom side of the at least one horizontal wall and being abutted to a bottom side of the at least one horizontal wall.

12. The joist subframe system of claim **1**, further comprising a plurality of elongate capping members, each of the plurality of elongate capping members configured to attach to ends of the elongate frame members, the plurality of elongate capping members being substantially perpendicular relative to the plurality of elongate frame members.

13. A joist subframe system, comprising:

a plurality of vertically arranged support members having a plurality of adjustable height securing members, each of the plurality of adjustable height securing members coupled with one of the plurality of support members and being selectively tightenable and loosenable to releasably be in a fixed position on the support member;

a plurality of horizontally arranged elongate frame members configured to support one or more overlying surface members, each of the plurality elongate frame members being further arranged in a substantially parallel configuration relative to others of the plurality of elongate frame members, each of the plurality of elongate frame members having:

an elongate body with at least one horizontal wall and at least one vertical wall, and

one or more support member attachment mechanisms each configured to couple one of the plurality of support members to the elongate body; and

a plurality of horizontally arranged elongate fastening members, each of the plurality of fastening members having a first end and a second end, the first end being attached to the at least one vertical wall of a first elongate frame member and the second end being attached to the at least one vertical wall of a second

elongate frame member, the first elongate frame member being adjacent to the second elongate frame member; and

an underlying surface having a plurality of receiving holes therein and a water proofing layer over the underlying surface, each of the plurality of receiving holes configured to receive a bottom end of one of the plurality of support members, the water proofing layer having a plurality of water proofing boots, each of the plurality of water proofing boots forming a water tight seal around a circumference of one of the plurality of support members.

14. The joist frame system of claim **13**, further comprising a plurality of foot members, each of the plurality of foot members abutted to a bottom end of one of the plurality of the support members and configured to cushion the bottom end of the support member against an underlying surface.

15. The joist frame system of claim **13**, wherein the elongate body comprises a "C" channel joist oriented such that the at least one horizontal wall is a central top wall with two vertical side wall, each of the plurality of support members being attached to the central top wall.

16. The joist frame system of claim **13**, wherein the elongate body comprises a "C" channel joist oriented such that the at least one vertical wall is a central vertical side wall with a horizontal top wall and a horizontal bottom wall, each of the plurality of support members being attached to at least the horizontal bottom wall.

17. The joist frame system of claim **13**, wherein the one or more support member attachment mechanisms is one or more through holes in the at least one horizontal wall of the elongate body, one of the plurality of support members being inserted through each of the one or more through holes, and

wherein the plurality of adjustable height securing members comprises a plurality of top securing members and a plurality of bottom securing members, each of the plurality of top securing members being attached to one of the plurality of support members on a top side of the at least one horizontal wall and being abutted to the top side of the at least one horizontal wall, each of the plurality bottom securing members being attached to one of the plurality of support members on a bottom side of the wall and being abutted to the bottom side of the wall.

18. A joist subframe system, comprising:

a plurality of vertically arranged support members having a plurality of adjustable height securing members, each of the plurality of adjustable height securing members coupled with one of the plurality of support members and being selectively tightenable and loosenable to releasably be in a fixed position on the support member;

a plurality of horizontally arranged elongate frame members configured to support one or more overlying surface members, each of the plurality elongate frame members being further arranged in a substantially parallel configuration relative to others of the plurality of elongate frame members, each of the plurality of elongate frame members having:

an elongate body with at least one horizontal wall and at least one vertical wall, and

one or more horizontal wall through holes, one of the plurality of support members being inserted through each of the one or more through holes, and

one or more vertical wall through holes; and

a plurality of horizontally arranged elongate fastening members, each of the plurality of fastening members having a first end and a second end, the first end being inserted through one of the one or more vertical wall through holes for attachment to the at least one vertical wall of a first elongate frame member and the second end being inserted through one of the one or more vertical wall through holes for attachment to the at least one side wall of a second elongate frame member, the first elongate from member being adjacent to the second elongate frame member,

wherein the plurality of adjustable height securing members comprises a plurality of top securing members and a plurality of bottom securing members, each of the plurality of top securing members being attached to one of the plurality of support members on a top side of the at least one horizontal wall and being abutted to the top side of the at least one horizontal wall, each of the plurality bottom securing members being attached to one of the plurality of support members on a bottom side of the wall and being abutted to the bottom side of the wall.

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